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Improving Aerosol and Visibility Forecasting Capabilities Using Current and Future Generations of Satellite Observations

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LONG-TERM GOALS (abstract from the proposal)

Critical to both military and civilian applications, the Navy Aerosol Analysis and Prediction System (NAAPS) is the only truly operational global aerosol and visibility forecasting model. Recent studies indicate that the utilization of satellite observations significantly improves NAAPS aerosol forecasting capability and reliability. To fully utilize the wide breadth and depth of various current satellite observations and to prepare for future reductions in aerosol sensing satellites over the next decade, we propose to construct a multi-channel, multi-sensor, and multi-task assimilation system to improve NAAPS forecasts for both current and future applications. The specific objectives of this study are to:

1. Finalize over-land and over-ocean aerosol assimilation methods using operational data assimilation quality MODIS and *Multiangle Imaging SpectroRadiometer* (MISR) aerosol products, and develop a framework for considering current and future satellite aerosol products.

2. Develop forward models to enable radiance assimilation capability for: 1) improving forecast performance over cloudy regions using the *Ozone Monitoring Instrument* (OMI) Aerosol Index; 2) preparing for the post-MODIS/MISR era using the *Geostationary Operational Environmental Satellite* (GOES).

3. Improve model representations of aerosol vertical profiles and the accuracy of aerosol speciation in NAAPS through the use of a 3-D aerosol assimilation, and generalized Angstrom exponent assimilation scheme.

4. Develop an improved 3-D parameterization for satellite observation and model forecasting error matrices using ground observations from the *Aerosol Robotic Network* (AERONET) and *Micropulse Lidar Network* (MPLNET).

We will collaborate with the algorithm developers and science teams for each of these aerosol-focused satellite and ground projects. This work will be coordinated with research efforts jointly supported by ONR 32, the ONR Young Investigator Program (YIP), and NASA to make the NRL product and radiance (aerosol) data assimilation system operational. These collaborations and associations provide excellent cost leveraging. The final outcome of this proposed research effort will be peer-reviewed papers, and a multi-channel, multi-sensor, and multi-task assimilation system to be delivered to NRL

Monterey for future implementation at the Fleet Numerical Meteorological and Oceanographic Center (FNMOC).

This grant is a new start grant that was put into place within the last three months. As per report instructions, a full report will be made in the subsequent year. The previous year's work can be found in the report assocated with N00014-08-1-0935.